

ART. I.—*New or Little-known Fossils in the National
Museum.*

XXVI.—SOME TERTIARY MOLLUSCA.

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(With Plates I-III.)

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Introductory Note.

The following paper deals with fourteen new species, and also discusses points of distribution in regard to eight other forms.

A large portion of this collection has been donated to the National Museum of late years by several indefatigable collectors, to whom the authorities are much indebted. Groups other than mollusca have been equally augmented, and they will be worked out as opportunity permits.

It will be seen by the present work that even as far back as Oligocene and Miocene times there existed many species of mollusca which are so closely related to living forms as to leave no doubt that they were the direct ancestors of our present molluscan types. Others have migrated from the Bassian area, and are now only found as varietal offshoots in warmer Australian waters.

List of Species Described:—

Pelecypoda.

- Pteria (Meleagrina) crassicardia, Tate sp.
- Ostrea ingens, Zittel.
- Neotrigonia bednalli, Verco var.
- Hinnites mulderi, sp. nov.
- Plicatula youngi, sp. nov.
- „ dennanti, sp. nov.
- „ brevispina, sp. nov.
- Spondylus baileyana, sp. nov.
- Modiolus mooraboolensis, sp. nov.
- Lucina (Codakia) planatella, Tate.
- Diplodonta harrisi, sp. nov.

Gasteropoda.

- Astralium (Imperator) hudsonianum, Johnston
- Turbo grangensis, Pritchard.

Xenophora (Tugarium) tatei, Harris.
 Cypraea siphonata, sp. nov.
 Erato obesula, sp. nov.
 Murex (Muricidea) gatliffi, sp. nov.
 Fusinus youngi, sp. nov.
 Solutofusus curlewisensis, sp. nov.
 Lyria acuticostata, Chapman.
 Voluta sexuaplicata, sp. nov.
 Cancellaria torquayensis, sp. nov.

Description of the Species.

Phylum MOLLUSCA.

Class PELECYPODA.

Order PRIONODESMACEA (Schizodonta).

Fam. PTERIIDAE.

Genus **Pteria**, Scopoli.

Subgenus MELEAGRINA, Lamarck.

PTERIA (MELEAGRINA) CRASSICARDIA, Tate sp.

Meleagrina crassicardia, Tate, 1886. Trans. R. Soc. S. Austr.,
 vol. viii., p. 14, pl. ix., figs. 9, 10.

Observations.—In Dennant and Kitson's List we find the following localities mentioned for this species: Muddy Creek (lower); Lower Moorabool; and Murray River Cliffs, Oyster bed. These localities indicate respectively, Oligocene (Balcombian), Miocene (Janjukian), and Lower Pliocene (Kalimnan). The present record, from the Beaumaris Cliffs, is new for the locality, and so links on to that of the oyster beds of the Murray River Cliffs, South Australia, in point of age. This species, therefore, has a remarkably extended range. The Beaumaris specimens are the umbonal parts of very heavy shells, whilst the Balcombian examples are generally much thinner and lighter.

In the Dennant collection there is also a juvenile shell of the same species from the Muddy Creek beds (upper or Kalimnan).

Additional Occurrence.—Beaumaris Cliffs, Port Phillip. Also upper beds at Muddy Creek. Age.—Kalimnan (L. Pliocene).

Fam. OSTREIDAE.

Genus **Ostrea**, Linné.

OSTREA INGENS, Zittel. (Plate I., Figs. 1, 2.)

Ostrea ingens, Zittel, 1864, Novara Exped., Geol. Theil,
 vol. i., p. 54, pl. xiii., fig. 3.

Ostrea nelsoniana, Zittel, 1864. Ibid., p. 55, pl. xi., fig. 7.

Ostrea hatcheri, Ortmann, 1897. Amer. Journ. Sci., vol. iv., p. 355, pl. xi., fig. 1.

Ostrea philippi, Ortmann, 1897. Ibid., p. 356, pl. xi., fig. 2.

Ostrea patagonica, von Ihering (non d'Orbigny), 1897. Rev. Mus. Paul., vol. ii., p. 221, pl. ix., fig. 2.

Ostrea hatcheri, von Ihering, 1899. Neues Jahrb., für Min., vol. v., p. 8.

Ostrea ingens, Zittel, Ortmann, 1900. Amer. Journ. Sci., vol. x., p. 379. Ortmann, 1902, Rep. Princetown Exped., Patagonia, 1896-99, vol. iv., pt. 2, p. 99, pl. xv., xvi., xvii., xviii., xix., figs a-c.

Observations.—The fauna of the Miocene or Middle Tertiary beds of Victoria and South Australia contains a large form of oyster which has never been assigned to a definite species. Many examples of these large bivalves are represented in the National Museum fossil collection, but have not been specified up to the present. I am now satisfied, however, that they are identical with the New Zealand and Patagonian species, *Ostrea ingens*.

Professor Tate's useful "Census of the Older Tertiary Fauna of Australia"¹ mentions on page 249 five species of *Ostrea* from the older Tertiary (that is, Balcombian to Kalimnan), as understood by Tate. But only four are listed in Dennant and Kitson's "Catalogue of the Cainozoic Fauna," etc.,² so that in all probability the fifth in Tate's estimate is that now referred to *O. ingens*, Zittel.

Characters of *O. ingens*.—The chief specific distinctions given by Ortmann, and now by the writer, are:—

1. Large size and extremely thick shell.
2. Situation of muscular scar. Muscle impression large, generally situated a little below the middle of the shell, and a little posteriorly.
3. Smooth margins of the inner side of the valves, except close to the area.
4. Slight development of the radial folds. In some there is a tendency for the lamellae to develop undulae or frills, but with no marked radial disposition.

This species of *Ostrea* has been referred by H. Suter to the subgenus *Anodontostrea* (Suter),³ the distinctive characters being the smooth inner margin. It seems, however, to belong to *Eostrea* (Ihering), for the dorsal region of the shell is often distinctly crenate.

Measurements.—Ortmann gives the length of the largest specimen as 255 mm. and the width as 162 mm.

The largest specimen in the National Museum collection appears to be an example from the Janjukian of Bairnsdale, having a length of 218 mm., and a width of 157 mm. Another specimen, from Cape Otway, also from Janjukian beds, measures 180 mm., by 135 mm.; this approaches *O. sturtiana*, Tate,⁴ in its oblong shape, but is very much

1. Journ. and Proc. Roy. Soc. N.S. Wales vol. xxii., pt. ii., 1888, p. 240.

2. Rec. Geol. Surv. Vict., vol. i., pt. 2, 1903.

3. Descriptions of New Tertiary Mollusca, Part I. New Zealand Geol. Surv. Palaeontological Bulletin, No. 5, 1917, p. 86.

4. Trans. Roy. Soc. S. Austr., vol. viii., p. 97.

larger and heavier, and is no doubt referable to *O. ingens*. Ortmann has already drawn attention to *O. sturtiana* as being closely allied to *O. ingens*.⁵ The specimen here figured is from Waurin Ponds (Janjukian), and measures 137 mm. by 112 mm.

A smaller but still heavy shell of great thickness is found in the Bailey collection from Beaumaris. It measures 120 mm. by 83 mm., and the principal lamellae number about 34. This is of Lower Pliocene age.

Distribution.—Victoria and South Australia: The Janjukian or Miocene of Bairnsdale, Cape Otway, Murray River Cliffs. Also in the Kalimnan or Lower Pliocene of Beaumaris, Port Phillip.

Elsewhere.—New Zealand: Oamaru and Pareora beds (Oligocene to Upper Miocene).

Patagonia: Upper part of Patagonian Formation and Suprapatagonian, Miocene.

Chile: Coquimbo Beds. Pliocene.

Fam. TRIGONIIDAE.

Genus *Neotrigonia*, Cossman.

NEOTRIGONIA BEDNALLI, Verco var. (Plate I., Fig. 3.)

Trigonia margaritacea, Lam., var. *bednalli*. Verco, 1907, Trans. Roy. Soc., S. Australia, vol. xxxi., p. 224, pl. xxviii., figs. 1-3.

Observations.—Dr. Verco regarded this form as a variety of the living *N. margaritacea*. From its occurrence in fossiliferous beds of Lower Pliocene age it can no longer be logically regarded as a variety of a recent type, and therefore it appears to be more consistent to give it specific rank.

This form has been taken in some abundance in the living state by Dr. Verco, who dredged it from St. Vincent's Gulf. A solitary specimen was previously found by Mr. W. T. Bednall in 1865, between the Semaphore and Glenelg.

This appears to be its first occurrence in the fossil state, and adds to the increasing list of species from the Kalimnan whose descriptions were originally based on living examples found round the Australian coast. *N. bednalli* has been dredged from 10 down to 200 fathoms. Dr. Verco's description runs as follows:—

"This variety is characterised by its very compressed shape, its narrow ribs, its large, oblong, plate-like spines, broader at their free than at their attached ends, features which are exceedingly constant in the very large series obtained."

Occurrence.—In shelly sand of Kalimnan age (Lower Pliocene), MacDonald's, Muddy Creek, near Hamilton, Victoria. Discovered and presented by Mr. James Hay Young.⁶

5. Princetown Univ. Exped., vol. iv., pt. ii., 1902, p. 105.

6. Mr. Young died on Feb. 10th, 1922. The Museum has been enriched on many occasions by his valuable discoveries.

Order PRIONODESMACEA (Isodonta).

Fam. PECTINIDAE.

Genus *Hinnites*, DeFrance.*HINNITES MULDERI*, sp. nov. (Plate II., Figs. 9, 10.)

Description.—Valves very inaequilateral, oblique, depressed. Anterior margin gently rounded near the umbo, truncately rounded towards the ventral, the posterior region is well-rounded, the margin sweeping forward and upward in an almost straight line to the umbonal angle made with the anterior. The neanic part of the shell is pectinoid, and feebly radiately striate, there being about sixteen fine costae. The ephebic and possibly gerontic stages show the characteristic irregularly undulose surface caused by the alternately concave and convex condition of the ventral edge; shell surface of later stages with a similarly striate and radiate ornament. Muscle impression large. Resilium small, acutely triangular.

Dimensions.—Left valve, length, 57 mm.; height, 59 mm. Height of pectinoid stage, 16.5 mm.

Observations.—The following characters distinguish this species from the allied *Hinnites corioensis*, McCoy⁷:—

1. Shell narrower or higher and more oblique.
2. Radial striae of pectinoid stage more numerous and finer.
3. Radial striae on ostreiform area not so strongly frilled by the crossing of the growth lines, the surface being sinuously striate, and not verruculate.

Occurrence.—In the white polyzoal limestone of Batesford, near Geelong. Janjukian (Miocene).

Two valves presented by the late J. F. Mulder, Esq. The species is named after its discoverer in recognition of his assiduous and successful work in bringing to light many interesting Cainozoic forms.

Fam. SPONDYLIDAE.

Genus *Plicatula*, Lamarck.*PLICATULA YOUNGI*, sp. nov. (Plate I., Figs. 4, 5.)

Description.—Shell moderately thin, subtrigonal, high, oblique; left valve strongly arched. With about 20 low, rounded plaits, only conspicuous towards the ventral margin, and apparently once divided from their base near the medium area. Umbonal area rugose with irregular folds. Growth-lines more strongly marked towards the ventral border and imbricated. The pair of strong teeth in the right valve are fused to a fairly large triangular area, which is transversely striate.

Dimensions.—Height of shell (right valve), 26 mm.; length, 17 mm.; depth of valve, 7 mm.

7. Prodomus Palaeont., Dec., vi., 1879, p. 31, pl. lviii.

Observations.—The long, triangular shape of the shell reminds one of *P. australis*, Lamarck,⁸ of the Philippines, but does not show the dominant sharp median ribs of that species, which extend from umbo to margin.

Occurrence.—In the Lower beds at Muddy Creek, near Hamilton, Victoria. Of Balcombian (Oligocene) age. Found by the late Mr. J. H. Young.

PLICATULA DENNANTI, sp. nov. (Plate I., Figs. 6, 7.)

Description.—Shell roundly trigonal, distinctly oblique. Right valve depressed, with more or less inflated umbo and marginal area; left valve depressed. Plicae few, about 7, bifurcating and rather acutely ridged. Teeth situated on a small, triangular hinge-plate.

Dimensions.—Right valve (cotype); height, 22 mm.; length, 18.5 mm. Left valve (cotype); height, 19 mm.; length, 15.5 mm.

Observations.—There are three examples of this species in the Dennant collection at the National Museum—two right valves and one left. A note by the late Mr. Dennant which accompanies this form says, "allied to *P. essingtonensis*." That species, however, differs from *P. dennanti* in the more numerous plicae, which are quite sharp; and in the nearly equilateral form of the shell. *P. essingtonensis*, Sowerby,⁹ is a Northern Australian shell.

Occurrence.—Lower beds at Muddy Creek, near Hamilton. Dennant collection. Of Balcombian (Oligocene) age.

PLICATULA BREVISPIA, sp. nov. (Plate I., Fig. 8.)

Description.—Shell subtriangular, moderately stout, slightly oblique. With about eighteen plicae, rarely bifurcated, slightly ridged and crossed by undulating growth-lines, which develop into nodose spines at their intersection near the ventral margin. The attached umbonal area flat, from which the shell slopes away at a steep angle. Teeth attached to a short dental plate, which is obliquely striated.

Dimensions.—Height of right valve, 25 mm. Length, 22.5 mm. Depth of valve, 7 mm.

Observations.—This species differs from *P. youngi* in the rounder outline, the sharp nodose ribs, and the smaller dental plate.

It is a very ornate form compared with other species, and the fossil example is well preserved. In the style of ornament it is not unlike *P. novae-zelandiae*,¹⁰ but that species is more depressed.

Occurrence.—Lower beds Muddy Creek, near Hamilton. Of Balcombian (Oligocene) age. Dennant Collection.

8. Anim. sans Vert., vol. vi., p. 85. Reeve, Conch. Icon., vol. xix., 1873, pl. iii., figs. 10a, c, d.

Reeve, Conch. Icon., vol. xix., 1873, pl. iii., fig. 8.

10. Sowerby in Reeve, Conch. Icon., vol. xix., 1873, pl. i, fig. 1.

Fam. SPONDYLIDAE.

Genus *Spondylus*, Linné.

SPONDYLUS BAILEYANA, sp. nov. (Plate II., Fig. 11.)

Description.—Valves roundly to obliquely ovate; left valve depressed, right valve moderately convex. Shell thinner than in *S. gaederopoides*, McCoy. Hinge-line moderately long for the genus. Anterior margin of the shell widely rounded, curving obliquely to the ventral margin, and broadly rounded at the posterior angle. Surface of shell ornamented with about 6 principal radii, which are more than usually adpressed to the shell, but at intervals projecting into sharp spines, more strongly developed towards the posterior extremity. Smaller and almost obsolete radii between the stronger ones. Growth-lines faint except towards the ventral margin of full-grown specimens; never developing further than as a series of depressed lamellae. Inner surface with the margin finely toothed. Muscle impression large, situated close to the umbo.

Dimensions.—Type specimen, left valve. Length, 74 mm.; height, 82 mm.

Observations.—This species is clearly the ancestral form of the living *S. tenellus*, Reeve,¹¹ which is found off New South Wales and Victoria (Western Port, Phillip Island and Portland). The fossil specimen is fully twice the height, with more widely spaced radii and stronger and more adpressed spines. The Kalimnan *Spondylus spondylioides* (or *arenicola*), Tate sp.,¹² from the Upper beds at the Murray Cliffs is distinguished by the more triangular shape and more spinous character, with obliteration of the concentric lamellae.

Occurrence.—In calcareous shelly marl, Beaumaris, Port Phillip. Collected by the late J. A. Bailey, after whom the species is named. Also in the Dennant collection, from Rose Hill, near Bairnsdale, and from McDonald's, Muddy Creek (F.C.).

Age.—Kalimnan (Lower Pliocene).

Order PRIONODESMACEA (Dysodonta).

Fam. MYTILIDAE.

Genus *Modiolus*, Lamarck.

MODIOLUS MOORABOOLENSIS, sp., nov. (Plate III., Fig. 17.)

Description.—Shell ovate, oblique, very tumid. Umbo small, incurved; a comparatively sharp umbonal ridge extending from beak to near the ventral margin, where it forms a broadly convex arch at the posterior

11. Reeve, *Conch. Icon.*, vol. ix., pl. xviii., fig. 67.

12. *Trans. Roy. Soc., S. Australia*, vol. viii., 1886, p. 19, pl. iv., fig. 6, as *Pecten spondylioides*. Renamed by Tate, 1896, in *Rep. Australasian Association for the Advancement of Science*, vol. vi., p. 318 as *Spondylus arenicola*. Although inappropriate, this earlier trivial name must stand, according to the rules of nomenclature.

angle. Ventral flexure or sinus well-marked, thus distinguishing it from *M. adelaidensis*, Tate, to which it bears some resemblance. The posterior margin is widely rounded, and meets the ventral margin at an obtuse angle. Surface finely wrinkled with growth striae.

Dimensions.—Height (circ.), 35 mm.; width (circ.), 29 mm.; depth of valve, 12 mm.

Observations.—This specimen from the Moorabool Valley was at first thought to be a mere variety of *M. pueblensis*, Pritchard,¹³ but finding other examples in the Dennant collection from Brown's Creek, Otway, showing the same strong umbonal angulation, there is no doubt that it is distinct. *M. adelaidensis*, Tate,¹⁴ also resembles this form in some particulars, but differs in having no conspicuous sinus on the ventral border. All the species here mentioned are confined to the Janjukian (Miocene).

Occurrence.—Type; in hard, yellow limestone, from the Moorabool River, near Maude. Geol. Surv. coll., W.T.M.4. Other specimens occur at Brown's Creek, Cape Otway (Dennant coll.).

Order TELEODESMACEA (Diogenodonta).

Fam. LUCINIDAE.

Genus *Lucina*, Bruguière.

Subgenus *CODAKIA*, Scopoli.

LUCINA (*CODAKIA*) *PLANATELLA*, Tate.

Lucina planatella, Tate, 1886, Trans. R.S., South Australia, vol. viii., pl. xii., fig. 11 (fig. only). Iden., 1887, *ibid.*, vol. ix., p. 146 (description).

Observations.—This species has hitherto been recorded only from Table Cape. Its occurrence in the hard, yellow limestone of the Moorabool Valley at Maude is additional evidence in favour of the correlation of these two beds. The shell is preserved in places, showing the typical ornament.

Dimensions of the present specimen.—Height, 50 mm.; width (circ.), 48 mm. The Table Cape specimen is much smaller, measuring 33 mm. by 31 mm.

Occurrence.—Moorabool River at Maude (Geol. Surv. Vict. coll. W.T.M.4).

Age.—Janjukian (Miocene).

Fam. DIPLODONTIDAE.

Genus *Diplodonta*, Bronn.

DIPLODONTA HARRISI, sp. nov. (Plate II., Fig. 12.)

Description.—Shell moderately large, subquadrate, tumid, with well-rounded beaks, and a well-marked umbonal ridge. Anterior margin

13. Proc. R. Soc. Vict., vol. xiv., pt. i., 1901, p. 26, pl. iii., fig. 1.

14. Trans. R.S. South Australia, vol. viii., 1886, p. 123, pl. xi., fig. 3.

incurved beneath the beaks and transversely rounded to meet the nearly straight ventral margin. Posterior margin subangular, meeting the hinge-line in a straight upward slope. Surface with concentric grooves and finer striae between.

Dimensions.—Height, 28 mm.; width, 28 mm.; thickness of the two valves, 16.5 mm.

Observations.—To some extent this species resembles the commoner and more widely distributed *Diplodonta balcombensis*,¹⁵ but the large umbones and the strong umbonal ridge, the squarer contour and the greater convexity all separate it from the other species.

I have much pleasure in naming this species after Mr. W. J. Harris, B.A., who discovered the shell.

Occurrence.—Bird Rock Cliffs, Torquay.

Age.—Janjukian (Miocene).

Class GASTEROPODA.

Order ASPIDOBANCHIA.

Sub-order RHIPIDOGLOSSA.

Fam. TURBINIDAE.

Genus *Astralium*, Link.

Sub-genus IMPERATOR, Montfort.

ASTRALIUM (IMPERATOR) HUDSONIANUM, Johnston. (Plate II., Fig. 15.)

Imperator (Astralium) imperiale (?) Johnston, 1876. Proc. Roy. Soc., Tasmania, p. 90c.

Imperator hudsoniana, Johnston, 1888. Geol. Tasmania, pl. xxix., figs. 12, 12a.

(?) *Imperator tasmanica*, Johnston, 1888. Ibid., p. 239.

Astralium (Imperator), johnstoni, Pritchard, 1896. Proc. Roy. Soc. Vict., vol. viii. (N.S.), pp. 116-118.

Astralium (I.) hudsonianum, Johnston, sp., Chapman, 1912. Proc. Roy. Soc., Vict. vol. xxv. (N.S.), pt. i., p. 188 and footnote 2.

Observations.—The figure given by Johnston in his Geology of Tasmania, although unaccompanied by any description, renders this form a valid species. In re-naming this form as *Astralium (Imperator) johnstoni*, Dr. Pritchard gives a very full description, and adds further Victorian localities.

The specimen before us, which we have taken the opportunity to figure, is from Rose Hill, Bairnsdale. It is a large and fairly well-preserved shell, having a maximum diameter of 72 mm., with a height of 35 mm. The characters agree almost exactly with those mentioned by Pritchard. The spiral threads are often coarse and broken

15. *Diplodonta subquadrata*, Tate. Trans. R. Soc., S. Australia, vol. ix., 1887, p. 147, pl. xiv., figs. 10a, b. *D. balcombensis* (nom. mut.), Pritchard, Victorian Naturalist, 1906, vol. xxiii., p. 117.

up, becoming erect and bluntly spinose. These spiral threads on the outer, peripheral side are radiately curved, and pass into the calcarate-portion of the shell.

An example from Table Cape, in the Dennant Collection, measuring 24 mm. in diameter, shows a very coarse spiral ornament on the earlier whorls of the shell.

Occurrence.—Here noted for the first time from Rose Hill, near Bairnsdale (donated by F. A. Cudmore to the National Museum). Other localities, mentioned by Dr. Pritchard are Keilor, Flemington, and the Moorabool Valley. Also found at Table Cape (Johnston, Dennant and Pritchard).

Age.—Janjukian (Miocene).

Genus *Turbo*, Linné.

TURBO GRANGENSIS, Pritchard. Plate II., Figs. 13, 14.

Turbo paucigranosa, Tate, MS. in Dennant, 1888. Trans. Roy. Soc. South Australia, vol. xi., p. 48.

Turbo hamiltonensis, Pritchard (non Harris, 1897), 1904. Proc. Roy. Soc. Vict., vol. xvii. (N.S.), pt. i., p. 329, pl. xix., fig. 4.

Turbo grangensis, Pritchard (nom. mut.), 1906. Victorian Naturalist, vol. xxiii., No. 6, p. 117.

Observations.—As the nomenclature of this species is rather involved, it may help future workers by recording the synonymy as above. In the Dennant Collection this particular species was labelled with Tate's MS. name. The most typical form there found is rather more depressed than Dr. Pritchard's type, probably owing to its being a more youthful shell. The measurements of this specimen are:—Height, 24.5 mm.; greatest diameter, 30 mm. Height of mouth, 15.5 mm. Diameter of umbilicus, 4 mm.

From the living perforated Turbos, *T. undulatus*, Martyn sp.,¹⁶ and *T. stamineus*, Martyn sp.,¹⁷ it differs both in ornament and contour, although distantly related. *T. undulatus* bears spiral ridges but they are not so pronounced, and the growth striae are not so conspicuously developed, whilst the beaded ornament is wanting. *T. stamineus* has the spiral ridges more pronounced, and the concentric growth-lines are developed as strong threads.

Occurrence.—Upper Beds at Muddy Creek and Grange Burn. Holotype from the Dennant Collection (Upper Beds, Muddy Creek). Another specimen, presented by Mr. F. P. Spry, from the Grange Burn, near Hamilton.

Kalimnan, Lower Pliocene.

16. *Limax undulatus*, Martyn, Univ. Conch, 1784, vol. i., fig. 29.

17. *Limax stamineus*, Martyn, *ibid.*, 1784, vol. ii., fig. 71.

Order CTENOBRANCHIATA.

Sub-order PLATYPODA.

Genus **Xenophora**, Fischer.

Fam. XENOPHORIDAE.

Sub-genus TUGURIUM, Fischer.

XENOPHORA (TUGURIUM) TATEI, Harris.

Xenophora (Tugurium) tatei, Harris, 1897. Cat. Tert. Mollusca. Brit. Mus., pt. i., Australasian Tertiary Mollusca, p. 254, pl. vii. figs. 7a, b.

Xenophora tatei, Harris, Hedley, 1903. Mem. Aust. Mus., Mem. iv., pt. 6, p. 357.

Observations.—This species is very remarkable for its great persistence in time. It first appears in the Oligocene of Muddy Creek, where it is of moderate dimensions. In the Janjukian, of the Murray River Cliffs and elsewhere, it attains an enormous size. It has not been found in the Kalimnan or Werrikooian to my knowledge, but reappears in recent dredgings, as recorded by Hedley.

The Oligocene Specimens.—In the Dennant Collection at the National Museum is a fair series of specimens from the lower beds at Muddy Creek. The smallest example has a diameter of 15 mm., whilst the largest measures 45 mm. The attached fragments on the surface of the shell are chiefly polyzoa and *Siliquariae*, but the latter may be idioparasitic; that is, growing upon the adventitious fragments. Newport, Altona and Mornington are also mentioned as localities by Dennant and Kitson.¹⁸ In the National Museum collection there are also examples from Grice's Creek, which have *Limopsis* and *Dimya* shells attached.

Janjukian Examples.—Dennant and Kitson's List¹⁹ includes the following localities: Camperdown, Shelford, Lower Moorabool.

A fine example of *X. tatei* in the National Museum from Bird Rock Cliffs, presented by Mr. F. A. Cudmore, is almost entirely covered by fragments of bivalves. The same donor presented an enormous specimen from the Murray River Cliffs, a quarter of a mile above Morgan (lowest bed).—See wall-case, Australian Fossil Gallery, Nat. Mus. This megalomorph shows that the Janjukian fauna was at its acme of development at this phase, and dwindled down in size to the present day to the same extent as when it existed in Oligocene times. The Murray River specimen, which is a cast and mould with fragmental covering, measures 115 mm. in diameter between the extreme surfaces of the mould. The internal cast is 98 mm. in diameter. The height of the shell was approximately 70 mm. The entire shell with encrusting fragments (small oysters) measures 22 cm.

18. Rec. Geol. Surv. Vict., vol. i., pt. ii., 1903, p. 113.

19. Op. cit., p. 113.

Recent Example.—The recent record of dredged specimens from New South Wales by Hedley²⁰ is of great interest to the student of persistent types. The localities given are: 63-75 fathoms off Port Kembla; 54-59 fathoms off Wata Mooli; 100 fathoms, 16 miles E. of Wollongong.

Hedley states that it "corresponds with actual fossil shells from Muddy Creek, with which I have compared it." One example was 30 mm. in diameter, and apparently half-grown.

Fam. CYPRAEIDAE.

Genus *Cypraea*, Linné.

CYPRAEA SIPHONATA, sp. nov. (Plate III., Fig. 16.)

Description.—Based on cast of shell. Body whorl inflated, subglobular pyriform; spire not exsert, rather depressed. Anterior prolongation of aperture very extended, nearly as long as the body whorl, produced in a straight line in the plane of the shell base (apertural surface); posterior canal produced as in *Cypraea sphaerodoma*, Tate.

Dimensions.—Length of body whorl without prolongations, 61 mm.; width of body whorl, 61 mm.; height, 50 mm.; length of anterior prolongation, 56 mm.

Observations.—This shell, here represented by a well-preserved and complete cast, is of the type of Tate's *C. sphaerodoma*.²¹ The remarkable and extensive anterior channel merits specific distinction. The longest anterior extension in *C. sphaerodoma* is, so far as I have seen, never more than one-fourth the length of the body whorl, and is always obtorted, never in a plane with the base.

Occurrence.—Tertiary (Janjukian). Below Overland Corner (left bank), and second cliff showing strata, below Waikerie, Murray River, South Australia. From the upper part of the cliff below the Kalimnan beds. Pres. and collected by Mr. F. A. Cudmore.

Genus *Erato*, Risso.

ERATO OBESULA, sp. nov. (Plate III., Fig. 18.)

Description.—Shell rather small, subrotund, spire small and depressed. Body whorl inflated. Outer lip thick, smooth, inner lip with one strong, curved plait. Aperture subcrescentic, moderately wide, canaliculate anteriorly. Surface polished, with faint folds in the line of growth.

Dimensions.—Length, 4.8 mm. Width, 4.25 mm.

Observations.—This species is by far the broadest shelled *Erato* from the Victorian Tertiaries. Its striking shape and smooth outer lip separate it from all previously described *Eratos* from this part

20. Mem. Austr. Mus., Mem. iv., pt. 6, 1903, p. 357.

21. Trans. R. Soc. S. Australia, vol. xliii., 1890, p. 209. Also vol. xliii., supplement, 1892, pl. viii., fig 5.

of the world. From *E. morningtonensis*, Tate,²² it differs in its greater width and depressed spire, whilst the outer lip is smooth, unlike that of *E. morningtonensis*, which is crenulated, and with the inner lip plaited. In its tumid form, *E. pyrulata*, Tate, approaches the present species, but differs in having a crenulated lip, and more exsert spire.

Occurrence.—In the blue clay of Balcombe Bay, Mornington. Found and presented by Mr. J. H. Gatliff. Balcombian (Oligocene).

Fam. MURICIDAE.

Genus *Murex*, Linné.

Sub-genus MURICIDEA, Swainson.

MUREX (MURICIDEA) GATLIFFI, sp. nov. (Plate III., Fig. 19.)

Description.—Shell of medium size, turritid, and with a short canal. Spire elevated, apical angle 36°, longer than the body whorl, consisting of six turns besides the protoconch. Suture deeply impressed, whorls rounded, subangulate below the middle, with costate varices often becoming lamellose or scaly, about 10 on body whorl. Costae crossed by fine rounded spiral threads, about 10 on the penultimate whorl, and 26 on the body whorl with even finer intermediate ones; one on the angulation much thicker and prominent. The entire surface crossed with fine varicial lines passing over the spiral and coarser threads. Aperture roundly pyriform, with a nearly straight canal. Inner lip having a thin callus and a single columellar fold about midway in the aperture; outer lip thin, smooth. Protoconch small, consisting of one and a half turns, the initial portion obtuse.

Dimensions.—Height, 26 mm.; length of body whorl, to end of canal, 16 mm.; width of body whorl, 14 mm.; greatest width of aperture from inner lip, 7 mm.

Observations.—The above species is not unlike some living Trophons in general outline,²⁴ but the tendency to form lamellose varices and its decided affinity both to *Murex asperulus*, Tate,²⁵ and *M. camplytropis*, Tate,²⁶ makes its generic position clear. From both the forms mentioned, *M. gatliffi* differs in the greater number of costae and in the shape of the protoconch; whilst *M. asperulus* has a larger and more twisted canal and less extended spire. *M. camplytropis* differs in having a heavier shell, denticulate outer lip and pseudo-umbilicus.

Occurrence.—In the blue clay of Balcombe Bay, Mornington. Bal-

22. Ibid., vol. xiii., 1890, p. 217.

23. Ibid., vol. xiii., p. 216, pl. xiii., fig. 12.

24. In making comparisons with living genera and species, I have been materially assisted by Mr. C. J. Gabriel, to whom by best thanks are due.

25. Trans. R. Soc. S. Australia, vol. x., 1888, p. 106, pl. iii., fig. 1.

26. Ibid., p. 105, pl.iii., fig. 2.

-combian (Oligocene). Collected and presented by Mr. J. H. Gatliff; named in recognition of his valuable work in Victorian conchology.

Fam. FUSIDAE.

Genus **Fusinus**, Rafinesque.

FUSINUS YOUNGI, sp. nov. (Plate III., Fig. 20.)

Description.—Shell long, fusiform. Spire turrated; apical angle 17° . Protoconch smooth, globular at apex, of two turns. Whorls angulate, upper and lower faces flat or slightly concave; shoulders carinate, with about 10 sharp almost spinose and flattened tubercles on each whorl. Ornamented with numerous, closely set, spiral lirae, interrupted on the siphonate part of the body whorl. Lirae crossed by numerous fine vertical threads, forming a delicate mesh-ornament. Aperture narrowly ovate. Canal long, inner lip smooth, outer thin.

Dimensions.—Length, 27 mm.; greatest width of body whorl, 7 mm.; length of spire, above body whorl, 12.5 mm.; width of aperture, 2 mm.

Observations.—The original specimen (holotype) was found at Curlewis, and in the Dennant Collection there is a specimen from the same locality, and also others from Shelford and Belmont not quite so elevated in the spire, but clearly referable to the same species. There is no other form quite related to this in the Victorian Tertiaries. From the New Zealand Tertiary, Suter has described²⁷ a *Fusinus* (*F. climacotus*) from the Oamaru Series of Enfield, which approaches the above species, but differs in the more numerous shoulder tubercles and coarser vertical growth-lines.

Occurrence.—Janjukian (Miocene), Curlewis. Collected and presented by the late Mr. J. Hay Young of Meredith. Also found at Belmont, Curlewis and Shelford by J. Dennant (Dennant coll.).

Genus **Solutofusus**, Pritchard.

SOLUTOFUSUS CURLEWISSENSIS, sp. nov. (Plate III., Fig. 21.)

Description.—Shell turrated, very attenuate. Whorls convex, slightly fluted vertically. Sutures deeply incised or canaliculate, partially separating the whorls. Aperture elongate, pyriform, with a long, slightly twisted canal, rather less than one third the length of the shell; inner lip thinly callused, outer lip fairly thick and transversely costate on the inside. Ornament of sharp lirae, with grooved interspaces, and a median thread; crossed by numerous vertical threads. Protoconch finely scaly, cylindrical, apically flattened of two and a half whorls. Neanic stage of shell with nearly obsolete costae, later whorls becoming evenly convex.

Dimensions.—Length, 56 mm.; width of body whorl, 13 mm.; height of protoconch, 2.5 mm.

27. Palaeontological Bulletin, No. 5, New Zealand Geological Survey, 1917, p. 21, pl. III., fig. 12.

Observations.—The separation of the whorls in this species is not so pronounced as in the genotype, *Solutofusus carinatus*, Pritchard,²⁸ but this character is too decided in the present form for its inclusion in *Fusinus* (formerly *Fusus*, pars). The slightly tuberculate costae of the earlier stage of the shell is suggestive of Tate's *Fusus hexagonalis*,²⁹ but the rounded later whorls and their canalication easily separates the two forms. It is worth noting that *Solutofusus carinatus* and *Fusus (Fusinus) hexagonalis*, Tate, agree in having an exert protoconch, whilst the present species has the apex flattened; so that that feature does not seem to be constant in *Solutofusus*.

Occurrence.—Janjukian (Miocene). Curlewis, near Geelong. Collected and presented by the late Mr. J. H. Young. There is a related specimen with ornament closer to *Fusinus hexagonalis*, but with canaliculate sutures, in the Dennant collection, from Shelford.

Fam. VOLUTIDAE.

Genus *Lyria*, Gray.

LYRIA ACUTICOSTATA, Chapman. (Plate III., Figs. 22, 23.)

Lyria acuticostata, Chapman, 1920. Proc. Roy. Soc. Vict., vol. xxxii. (N.S.), pt. ii., p. 241.

Observations.—Since the above-mentioned description was written, I have been able to identify some smaller and rather rare shells of the genus from the Balcombian, with the larger and better developed Miocene forms. These smaller forms have all the essential characters of the Ooldea and Torquay fossils, but are thinner in build, though otherwise typical; they are therefore included here under the same trivial name, and may be regarded as ancestral and deep water forms (of Balcombian age), of the Ooldea shells (of the Janjukian).

Dimensions.—Length of a full-grown Balcombian shell (from Balcombe Bay), 23 mm. Length of a shell from Torquay, 42 mm. Length of a Janjukian shell from Ooldea, circ. 60 mm.

Occurrence.—Balcombian (Oligocene). Balcombe Bay and Grice's Creek, Port Phillip. Janjukian (Miocene), Bird Rock Cliffs, Torquay, Victoria; and Ooldea, South Australia.

Genus *Voluta*, Linné.

Sub-genus *AULICA*, Gray.

VOLUTA (AULICA) SEXUAPLICATA, sp. nov. (Plate III., Fig. 24.)

Description.—Shell long-ovate with hemispherical protoconch of two and a half turns, moderately large and turbinoid. Apical angle of shell 33°; consisting of four depressed convex whorls, with im-

28. Proc. Roy. Soc. Vict., vol. xi., pt. i., 1898, p. 102, pl. vii. figs. 1, 1a, 2.

29. Trans. Roy. Soc. S. Australia. vol. x., 1888, p. 139, pl. iii., figs. 15a, b.

pressed sutures. Outer lip not so extensive as in *V. ellipsoidea*, with a straight margin rather than convex; inner lip with a thin callus and six plaits, of which the anterior is oblique, and just within the entrance to the canal, the second, third and fourth slightly oblique and evenly spaced, the fifth and sixth smaller and close together beyond the second third of the inner lip margin. Surface nearly smooth, covered with fine indistinct striae, both spiral and vertical.

Dimensions.—Length, 72 mm. (body whorl, 46 mm.; spire, 26 mm.). Width of body whorl, 23.5 mm. Height of protoconch, 4 mm.

Relationships.—The nearest species to which the above form is related is *V. ellipsoidea*, Tate.³⁰ It differs, however, in the depressed convexity of the whorls, the compression of the outer lip, the narrower protoconch, the more oblique sutures, and the absence of lirae. Besides these differences, *V. sexuaplicata* has the two extra pliae on the inner columellar lip.

Occurrence.—*Voluta (Aulica) sexuaplicata* is represented by a well-preserved example from the Balcombian (Oligocene) of Clifton Bank, Muddy Creek, presented by Mr. G. P. Tait.

Fam. CANCELLARIIDAE.

Genus *Cancellaria*, Lamarck.

CANCELLARIA TORQUAYENSIS, sp. nov. (Plate III., Fig. 25.)

Description.—Shell bucciniform, stout, with a small rounded protoconch of two turns, and five moderately convex whorls. The ephebic and neanic stages have rather flattened whorls, ornamented with well marked spiral striae, vertically lineated. Penultimate and body whorl inflated, with about 15 rounded costae; both these and the interspaces transversely grooved with deeply incised lines.

Dimensions.—Height, 23 mm.; width of body whorl, 15 mm.; height of body whorl, 14.5 mm.

Observations.—This shell is of the type of *Cancellaria australis*³¹ in the costate and spirally grooved ornament. The spire in *C. torquayensis* is more elongated and the costation is not seen until the fourth whorl.

Occurrence.—Janjukian (Miocene). Bird Rock Cliffs, Torquay. Collected and presented by Mr. F. A. Cudmore.

CORRIGENDA.

New or Little-known Victorian Fossils, part xxv., Proc. Roy. Soc. Vict., vol. xxiii. (N.S.), 1921.

P. 224, eighth line from the bottom—for "*Aveolites*" read "*Alveolites*."

30. Trans. Roy. Soc. S. Australia, vol. x., 1888, p. 176, pl. xiii., fig. 4; and vol. xi., 1889, p. 127.

31. *Cancellaria australis*, Sowerby. Conch. Illustr., 1841, fig. 23. Thesaurus Conch., vol. ii., p. 442, pl. xciv., figs. 72, 73.

Also plate ix. title—for "Michelina" read "Michelinia."

Plate x. title—for "Michelina," read "Michelinia," and for "Romingera," read "Romingeria."

EXPLANATION OF PLATES.

PLATE I.

- Fig. 1.—*Ostrea ingens*, Zittel. Interior of left or lower valve. Miocene (Janjukian). Waurn Ponds, Geelong, Mulder coll., circ. two-thirds natural size.
- „ 2.—*O. ingens*, Zittel. Exterior of same specimen. Circ. two-thirds natural size.
- „ 3.—*Neotrigonia bednalli*, Verco var. Left valve. Lower Pliocene (Kalimnan). Macdonald's, Muddy Creek, Pres. J. H. Young. Slightly enlarged.
- „ 4.—*Plicatula youngi*, sp. nov. Exterior of right valve. Oligocene (Balcombian). Clifton Bank, Muddy Creek. Coll. J. H. Young. Slightly enlarged.
- „ 5.—*P. youngi*, sp. nov. Interior of right valve of same specimen. Slightly enlarged.
- „ 6.—*Plicatula dennanti*, sp. nov. Exterior of right valve. Oligocene (Balcombian), Lower Beds, Muddy Creek. Coll. by J. Dennant. Slightly enlarged.
- „ 7.—*P. dennanti*, sp. nov. Interior of a left valve. Oligocene (Balcombian), Lower Beds, Muddy Creek. Coll. J. Dennant. Slightly enlarged.
- „ 8.—*Plicatula brevispina*, sp. nov. Exterior of right valve, Oligocene (Balcombian), Lower Beds, Muddy Creek. Coll. J. Dennant. Slightly enlarged.

PLATE II.

- Fig. 9.—*Hinnites mulderi*, sp. nov. Left valve. Miocene (Janjukian). Batesford, near Geelong. Pres. J. F. Mulder. Nat. size.
- „ 10.—*H. mulderi*, sp. nov. Interior of left valve of same specimen. Nat. size.
- „ 11.—*Spondylus baileyana*, sp. nov. Left valve. Lower Pliocene (Kalimnan), Beaumaris, Port Phillip. J. F. Bailey coll. Nine-elevenths nat. size.
- „ 12.—*Diplodonta harrisi*, sp. nov. Left valve. Miocene (Janjukian), Torquay, near Geelong. Pres. by W. J. Harris. Nat. size.
- „ 13.—*Turbo grangensis*, Pritchard. Umbilical aspect. Lower Pliocene (Kalimnan). Grange Burn, near Hamilton. Dennant coll. Slightly enlarged.
- „ 14.—*T. grangensis*, Pritchard. Same specimen, lateral view. Dennant coll. Slightly enlarged.
- „ 15.—*Astralium (Imperator) hudsonianum*, Johnston. Miocene (Janjukian). Rose Hill, near Bairnsdale. Pres. F. A. Cudmore. Slightly enlarged.

PLATE III.

- Fig. 16.—*Cypraea siphonata*, sp. nov. Cast of shell in matrix. Miocene (Janjukian). Murray River Cliffs, South Australia. Presented by F. A. Cudmore. Circ. nine-tenths nat. size.
- „ 17.—*Modiolus mooraboolensis*, sp. nov. Right valve. Miocene (Janjukian), Moorabool River, near Maude. Coll. Geol. Surv. Vict. Five-eighths nat. size.
- „ 18.—*Erato ovesula*, sp. nov. Oligocene (Balcombian). Balcombe Bay, Port Phillip. Pres. by J. H. Gatliff. Enlarged slightly more than four-thirds.
- „ 19.—*Murex (Muricidea) gatliffi*, sp. nov. Oligocene (Balcombian), Balcombe Bay. Pres. J. H. Gatliff. Slightly enlarged.
- „ 20.—*Fusinus youngi*, sp. nov. Miocene (Janjukian). Curlewis, near Geelong. Pres. J. H. Young. Enlarged nearly twice nat. size.
- „ 21.—*Solutofusus curlewisensis*, sp. nov. Miocene (Janjukian). Curlewis. Pres. J. H. Young. Enlarged seven-sixths nat. size.
- „ 22.—*Lyria acuticostata*, Chapman. Megamorphic example. Miocene (Janjukian). Torquay, near Geelong. Dennant coll. Nat. size.
- „ 23.—*L. acuticostata*, Chapman. Micromorphic example. Oligocene (Balcombian). Balcombe Bay. Nat. size.
- „ 24.—*Voluta sexuaplicata*, sp. nov. Oligocene (Balcombian). Clifton Bank, Muddy Creek. Pres. G. P. Tait. Nat. size.
- „ 25.—*Cancellaria torquayensis*, sp. nov. Miocene (Janjukian). Bird Rock Cliffs, Torquay. Pres. F. A. Cudmore. Slightly enlarged.